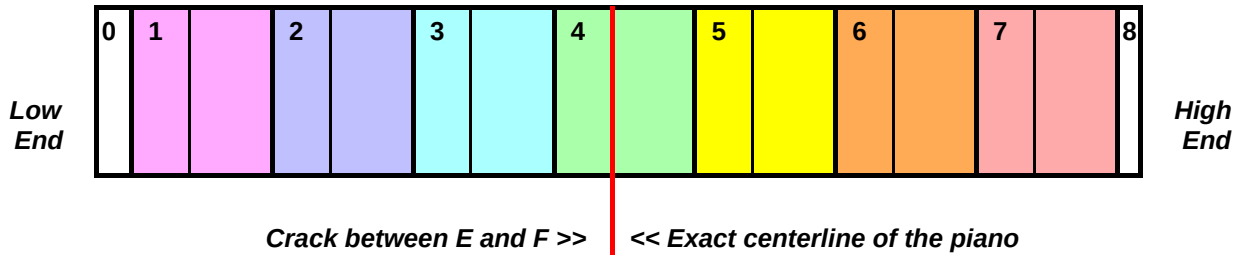
1905-16a

# Conceptual Basis of Key Maps for Piano

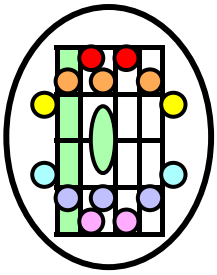
**KMA-20**

***1. Notes move left and right in sync with finger movements and visually identify which keys to play. 2. Notes are drawn to scale for both PITCH and RHYTHM.***

***Based on a Piano Keyboard Labeled With The Rainbow Colors of the 7 Identical Octave Groups***




***From the Music Innovator's Workshop***



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# Genesis

***This unit is about the concepts, thoughts and ideas that energized the development of the key maps notation for the piano (and other keyboards). Because this has involved so many personal decisions, I have decided to write this in the first person. I have been working on the development of this music for most of my adult life - full time since I retired in 1995. I became interested in music notation when I was a student at Wheaton College, Illinois where I received my AB degree as a music major in 1954.***

***Since college I have spent a good bit of my time experimenting with ways of improving music notation. Some of the motiviation for this came from my experiences teaching (or trying to teach) my 5 children to play the piano. They all had similar responses: "Dad, this is too hard!" I had a tendancy to blame this on the notation though, mainly, it was hard because learning to play the piano is so very, very demanding. Since retiring almost 25 years ago I have been able to spend full time researching and experimenting with notation, developing the key map notation, the basic piano courses, and teaching piano.***

***Music Notation As A Visual Art.*** ***One concept that has motivated my effort is that I see music notation as a visual art form, in addition to its primary role in making music. It can be beautiful and interesting in its own right!. I won't try to explain this. While developing the windows music, I was constantly on the lookout for visual beauty that might be reflected in the notation. I love to see multiple colors - and I'm happy to see the colors of the rainbow as an integral element in the windows notation.***

***The Main Objective.*** ***Of course, the beauty of the windows for piano notation is a by-product of the main objective which is to produce a practical notation that is as easy as possible to learn and read. The great challenge is to make it easier to learn and read than the traditional notation. Traditional notation is the de facto standard worldwide. It is an incredible invention of mankind and greatly to be respected. I intend for the key map notation to live alongside the traditional notation "in perfect harmony." Clearly, I am NOT trying to replace it.***

***"Not Trying to Replace it?"*** ***Then what is the role of the key map notation? Its role is to provide an effective supplementary notation that makes learning to play the piano MUCH easier, more rapid, and less stressful. I teach my students the piano basics with key map notation first, then traditional notation when they have learned to play with a modest level of skill. (Most of them continue to play from the key map notation while learning to play from traditional notation.)***

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# *Key Maps in Brief*

| | |
|---|---|
| ***What is a Key Map?*** | ***A key map is music notation specifically designed for pianos and other keyboard instruments. Key maps are vertically oriented contour maps of the keyboard with notes that show the LOCATIONS of the keys that must be played to perform a musical composition. For rhythm, the physical length of each note is proportional to its length in beats, showing exactly how long to hold each musical sound.*** |
| ***Reading Pitch*** | ***Reading pitch on the maps is enabled by the fact that the keys of the keyboard form 7 identical 12-key visual patterns (C to B). We call these patterns of keys, Octave Groups. These octave group patterns of the keys provide the basic structure for each map. The octave groups are distinguished from each other by their locations from left to right, and by their colors on the maps. For beginners, colored labels are placed on the keyboard. The colors on the labels match the colors of the octave groups on the maps.*** |
| ***Reading Rhythm*** | ***Notes on key maps have vertical lengths that are proportional to their time durations in beats. Reading the rhythm is enabled by equally spaced thin horizontal lines that cross the staff at each BEAT, and by contrasting heavy lines that are equally spaced and cross the staff at the end of each MEASURE.*** |
| ***Basic Pitch Terminology*** | ***Most of the terminology of traditional notation is used for key maps. Traditional PITCH NAMES (A thru G) are used for the notes and keys. However, the black keys (and their notes) are given what we call "addresses" in addition to their traditional names. These addresses are the numbers 1, 2, 3, 4, and 5 beginning with C#/Db as key 1. The "octave groups" are numbered from 0 thru 8 in accordance with American Standard Pitch Notation (ASPN) terminology. (Middle C is the first note of Octave 4.)*** |
| ***Basic Rhythm Terminology*** | ***The terminology for rhythm on key maps is based on beats rather than on the whole note. (There are notes of - 1 beat, 2 beats, 4 beats, 6 beats, 1/2 beat, 1/3 beat, 3/4 beat, etc.) The number of beats of a note is determined by reading the beat lines crossing the staff at equal intervals.*** |

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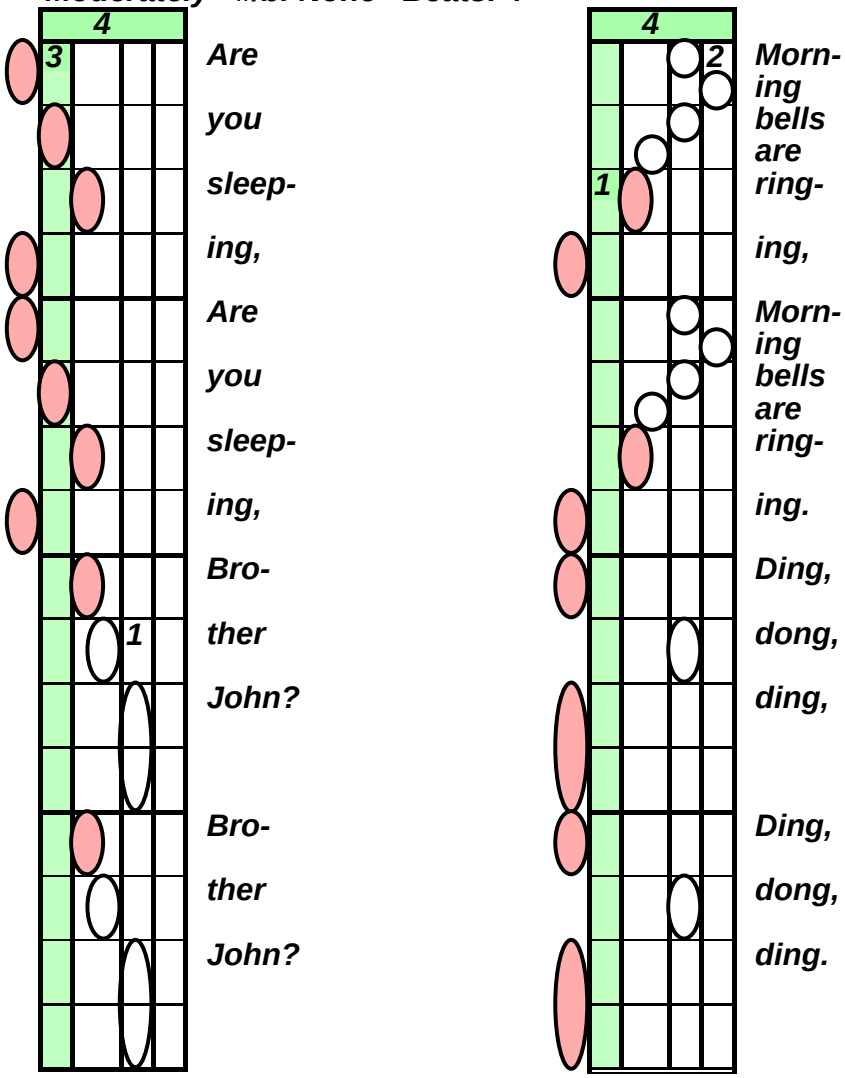
# Brother John

***Here is a sample of a simple children's song on a key map. The vertical lines are the locations of the black keys The notes with the pink fill are for the left hand. The heavy horizontal lines mark the measures; the light horizontal lines, the beats. (The space between two horizontal lines shows the length of a beat.The physical length of each note is proportional to its time in beats.***

***Traditional Tune***

***Moderately #/b: None Beats: 4***

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***What IS the Conceptual Basis for the Key Map Notation?*** ***Because creating and playing music is such an incredibly complex process, the notation must be based on a large number of concepts for it to work. These concepts will be explained in this unit. But to begin, there is one major concept that provides a basis for all of the other concepts that go into making a practical and effective notation. This is the idea of the Graphical User Interface (GUI) that provides the basis for user control of computers.***

***The Graphical User Interface (GUI).*** ***I'm sure most readers are aware of this concept as it applies to computers and computing. As it turns out, the GUI also provides the basis for a very practical and effective musical notation. On a computer the GUI provides a tactual and visual connection between the user and the desired action using a mouse (or trackball). The user using the mouse points a cursor to the desired image on the computer screen, presses a button to activate the image, and the desired action takes place. The GUI enables the computer user to operate the computer without knowing, or needing to use the underlying code, which would otherwise be necessary.***

***Playing From Graphic Rather Than Coded Information.*** ***An obvious parallel to this GUI action is for a pianist seeing a desired note on a diagram of the keyboard (the notation), "point" to the corresponding key on the keyboard, and activate (play) the key. No code necessary! This takes care of the "pitch" component of the notation. A similar visual process works for the rhythm. On the notation, the physical length of the note is proportional to the time that it takes, and markers on the notation (horizontal lines) indicate the proportional passing of time (beats). The pianist simply holds the key down for as long as the physical length of the note (in beats) indicates. Thus, the graphics in the notation SHOW both the pitch and rhythm WITHOUT the need for any coded information.***

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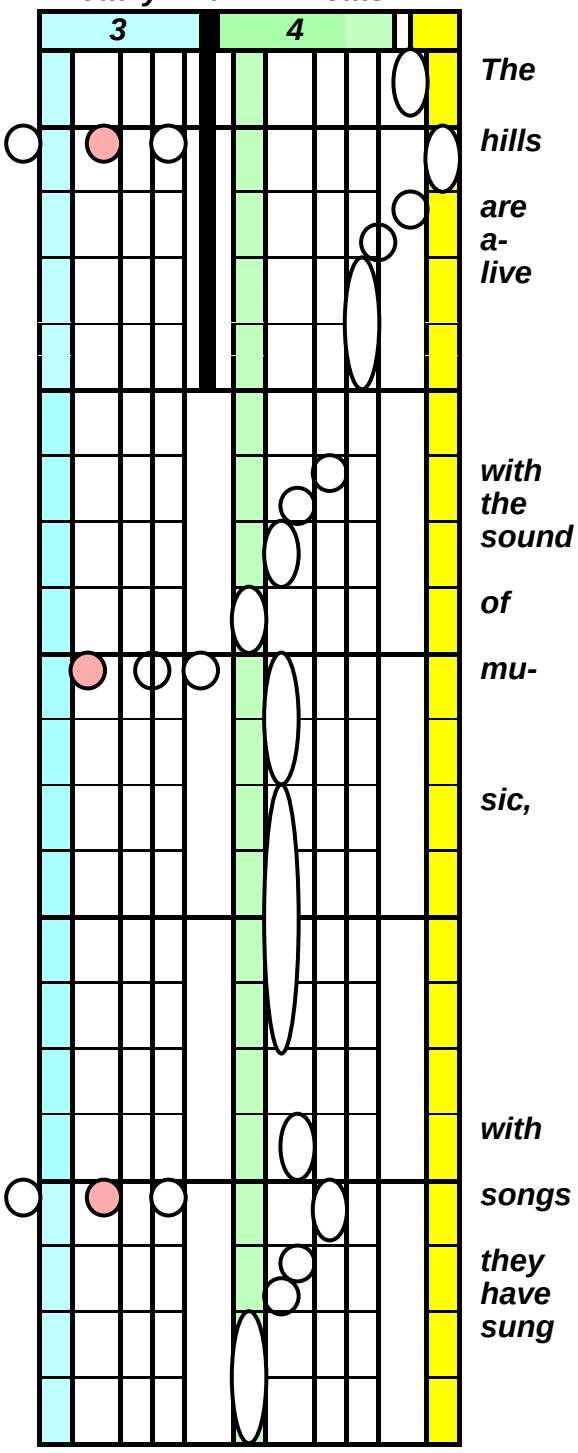
# Example - Key Map

*from THE SOUND OF MUSIC*
*Oscar Hammerstein II Richard Rogers*
*Broadly b: 1 Beats: 4*

*Lead Sheet Version With Chords*




*The thick vertical black line at the top of each staff provides a visual indicator of the dividing line between the bass and treble notes.*

***Key maps are designed to be beautiful! They show the pitch and rhythm in a TruScaled format. They are enhanced with the colors of the rainbow. Many of the key maps are interesting and beautiful to look at in addition to the beauty in the sounds of the music. Key maps are truly a visual art. This visual beauty is one of the reasons we love to play from key maps!***

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# The Awesome Keyboard

***The piano keyboard (and other keyboards as well - especially the organ) provides a unique visual and tactual display of the full range of sound pitches used to create music in our culture.***

## Chromatic Scale

***The keyboard arranges these sounds in half steps from low to high at the back side of the keyboard, where the black and white keys are mixed together.***

## C Major Scale

***Across the front of the keyboard, the white keys are arranged to provide a C major scale across the entire usable sound spectrum.***

## The Magic of the Black Keys

***This is awesome: The keyboard has been designed so that any of its 88 keys can be found quickly (in a fraction of a second by skilled musicians) BY TOUCH OR BY SIGHT! This is made possible by the protruding black keys, arranged in 2's and 3's, across the entire keyboard. Any key can be identified and found, first by its general location, and then by touch.***

## Conceptual Basis For the Pitch Notation

***This arrangement of white and black keys along with the steady progression o the musical sounds in equal sized half steps from low to high makes the keyboard a perfect candidate for a graphic notation system that shows the location of each key (sound) on a diagram of the keyboard. This idea of notating the music on a diagram that shows which keys to play is the conceptual basis for the pitch notation.***

## Conceptual Basis For the Rhythm Notation

***Because the keys on the keyboard all represent equally spaced sound relationships (half step intervals), all notes in key maps also show equally spaced sound relationships. The result is that all intervals of a given size (in sound) are also the same size in the spacing of the notes. I call this TruScaled. It leads to the concept that the time lengths of notes be TruScaled as well. This results in graphically making the lengths of all notes in a composition proportional to the time in beats that they take. Thus, a 2-beat note is twice as long (graphically) as a 1-beat note.***

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## Conceptual Basis For the Vertical Staff

***Unlike the horizontal staff in traditional notation, the key map notation staff must be oriented vertically so that the notes can move to the left and right in sync with the movements of the fingers on the keyboard. This one to one relationship between the moves of the fingers and notes is a much more intuitive movement than in traditional notation and clearly makes learning to read and play the notes less difficult.***

## The Vertical Staff as a Timeline

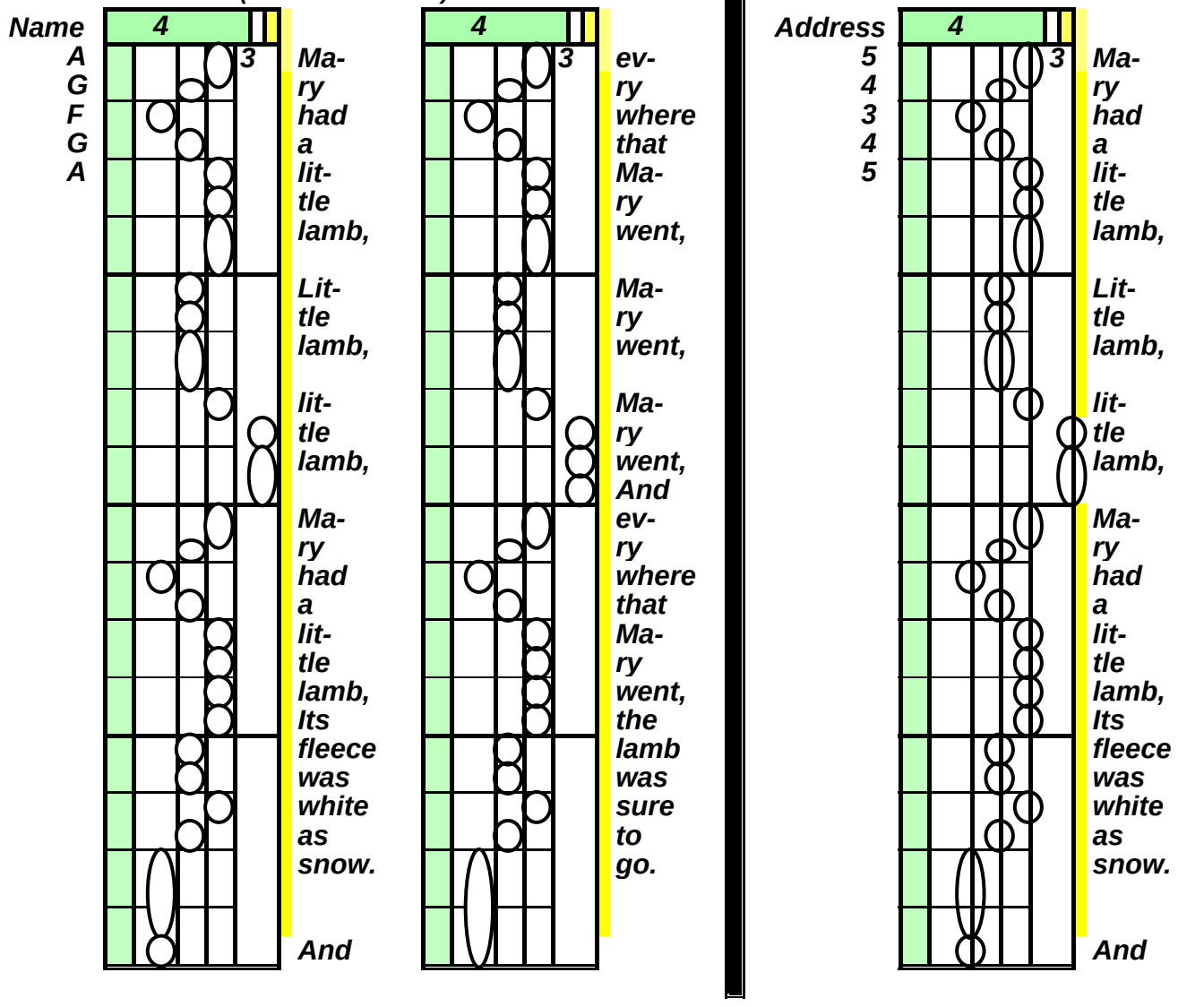
***Another basic concept of the key map notation, illustrated below, is the use of the vertical staff as a timeline, providing the basis for the notation of rhythm.***

# Mary Had a Little Lamb - Windows Key Maps

***Sara Josepha Hale*** ***Traditional tune*** ***Version Played on Black Keys***

***Moderately b: 1 Beats: 4*** ***Moderately b: 6 Beats: 4***

***(Basic RH Version)***

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***Comparing the Notations**. As I acknowledged earlier, traditional notation is the de facto standard of notation worldwide and needs to be retained. As such, it needs no defense. The key map notation is a supplementary notation to be used when its advantages for learning to play and read are desired. When comparisons with traditional notation are made on the following pages, they are to let the natures of each notation be seen and understood. An unfavorable comparison is not an attack, and simply should be taken at face value.*

***Similarities of These Notations.** It needs to be uderstood that both notations are intended to accomplish the SAME OUTCOMES. As such, there will be many similarities between the two notations. This is a good thing! Although key map notation is a robust notation, for many people it will serve as a springboard to learning and playing from traditional notation. It needs to be observed that these notations are compatible on many levels. They're both meant to make great music! Immediately following are some very important commonalities existing in these two notations.*

***Instructions, Symbols, etc.** The key map notation makes no attempt to change the myriads of performance instructions, codes and marks that guide the performance of a piece but don't alter the notes. These include written remarks and symbols having to do with tempos, changes of tempos, accents, staccatos, D.C., Coda, pp, ff, mf, crescendos, decrescendos, changes in sound volume, and the like. The alpha-numeric chord symbols that have become so popular in recent years are also common to both notations.*

***Note and Chord Names.** Note and chord names are the same in both systems. However, double sharps and flats are eliminated from the key map notation and are replaced by their enharmonic equivalents. Concept: Double sharps and flats are a part of the harmonic structure of music, but are unnecessary for playing the keys and cause unnecessary reading difficulty. Also, sharps and flats on white keys are similarly replaced by their enharmonic equivalents, the natural note names. (These changes give precedence to easy reading and playing over displaying the true harmonic structure of these notes. These changes affect advanced pieces but don't affect beginner's music.)*

***Fingering Numbers 1-5.** The fingering numbers in both systems are identical. These numbers apply to the same fingers in both systems and are essential components of both.*

***Black Key "Addresses."** Although key map notation retains the traditional names of the black keys, it refers to the black keys and their notes by their "addresses" 1234 and 5. This is a very effective simplification for beginning students. It enables the notation to include black keys in the mainstream of notes from the very beginning of instruction. Concept: Black keys are the main guideposts on the keyboard for both visual and tactual recognition. Black keys provide the only way of recognizing and locating white keys. In the key map notation, notes for black keys are located on the staff lines (white notes between the staff lines).*

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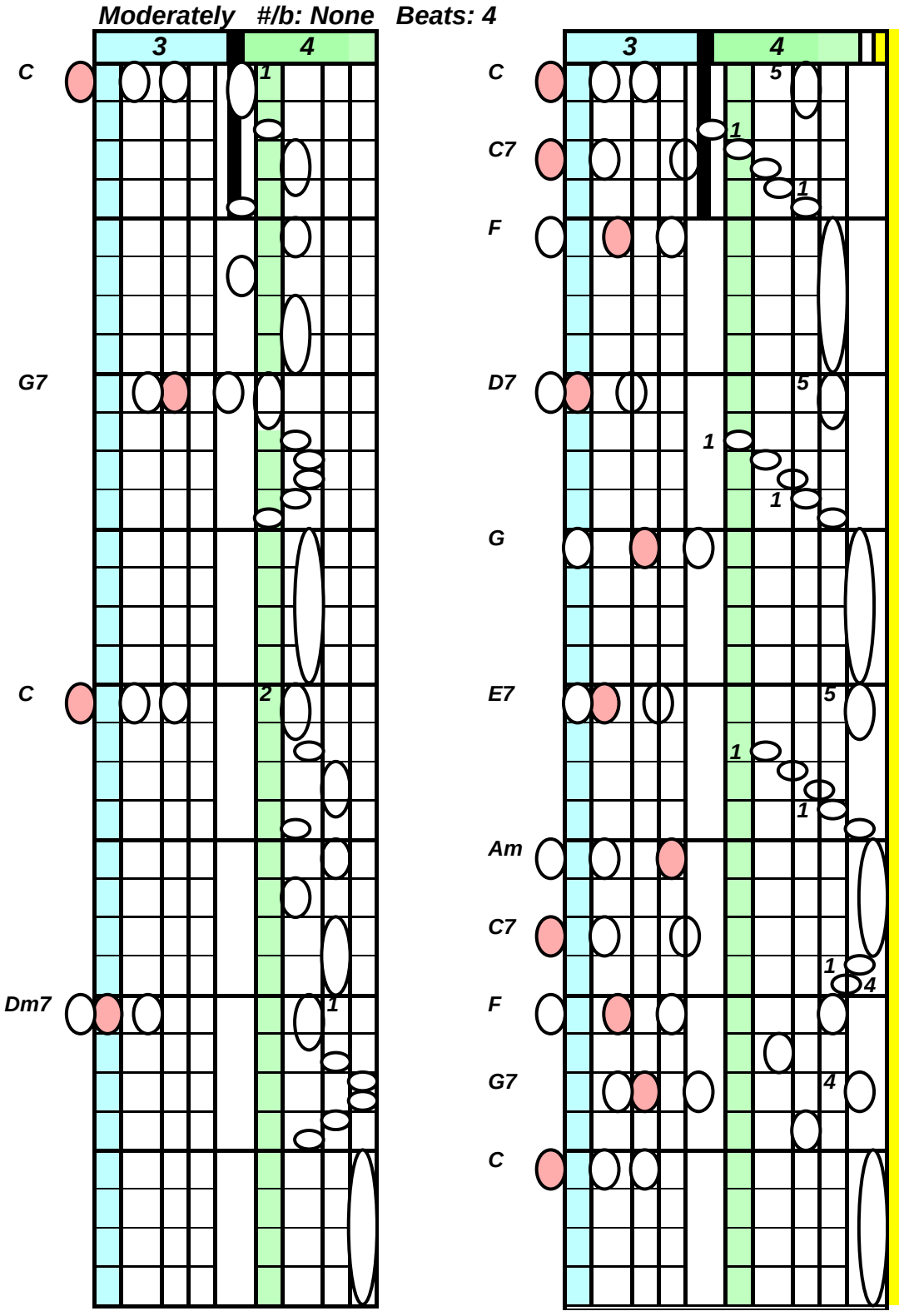
# Do-Re-Mi – From the "Sound of Music"

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# The Octave Group - A Basic and Important Organizing Concept for Key Map Notation

***The 7 Octave Groups.*** *The next page illustrates another essential concept that makes the key map notation easier to learn and read. (The illustration of the keyboard is squeezed onto the next page to show all of its components.) The diagram shows how the keyboard can be divided conceptually into 7 identical sections of 12 keys each (with 3 extra keys on the left end and an extra C on the right). I call these 7 sections Octave Groups, as they all span the space of an octave.*

***Identical 12 Notes in Each Octave Group.*** *These octave groups are identical to each other and make it possible to use the same 12 notes for each identical group of keys. The notes in a group are distinguished from the notes in other groups by their locations and by color - as are the keys themselves. (The 7 groups are also numbered in the notation from 1 thru 7.)*

***The 7 Rainbow Colors.*** *Each octave group is identified with one of the 7 colors of the rainbow (in the order that they appear in the color spectrum). These colors appear on the musical staff and, for beginners, they also appear on labels that are placed on the keyboard. Experienced players recognize these groups on the keyboard simply by their locations. Of course, the purpose of identifying the groups by their colors is to make it as easy as possible to find the groups on the keyboard that these colors stand for. To be clear, these colors are placed on the musical staff and on the keyboard, NOT on the notes.*

***The Sub-Groups of the Octave.*** *Each octave group is made up of 2 sub-groups, the "low group" and the "high group". The low group is made up of the white keys C, D and E and the included black keys 1 and 2. The high group is made up of the other 7 keys of the octave group. These subgroups help the player clearly conceptualize the location of each key on the keyboard. This proivdes a basis for rapidly finding targeted keys.*

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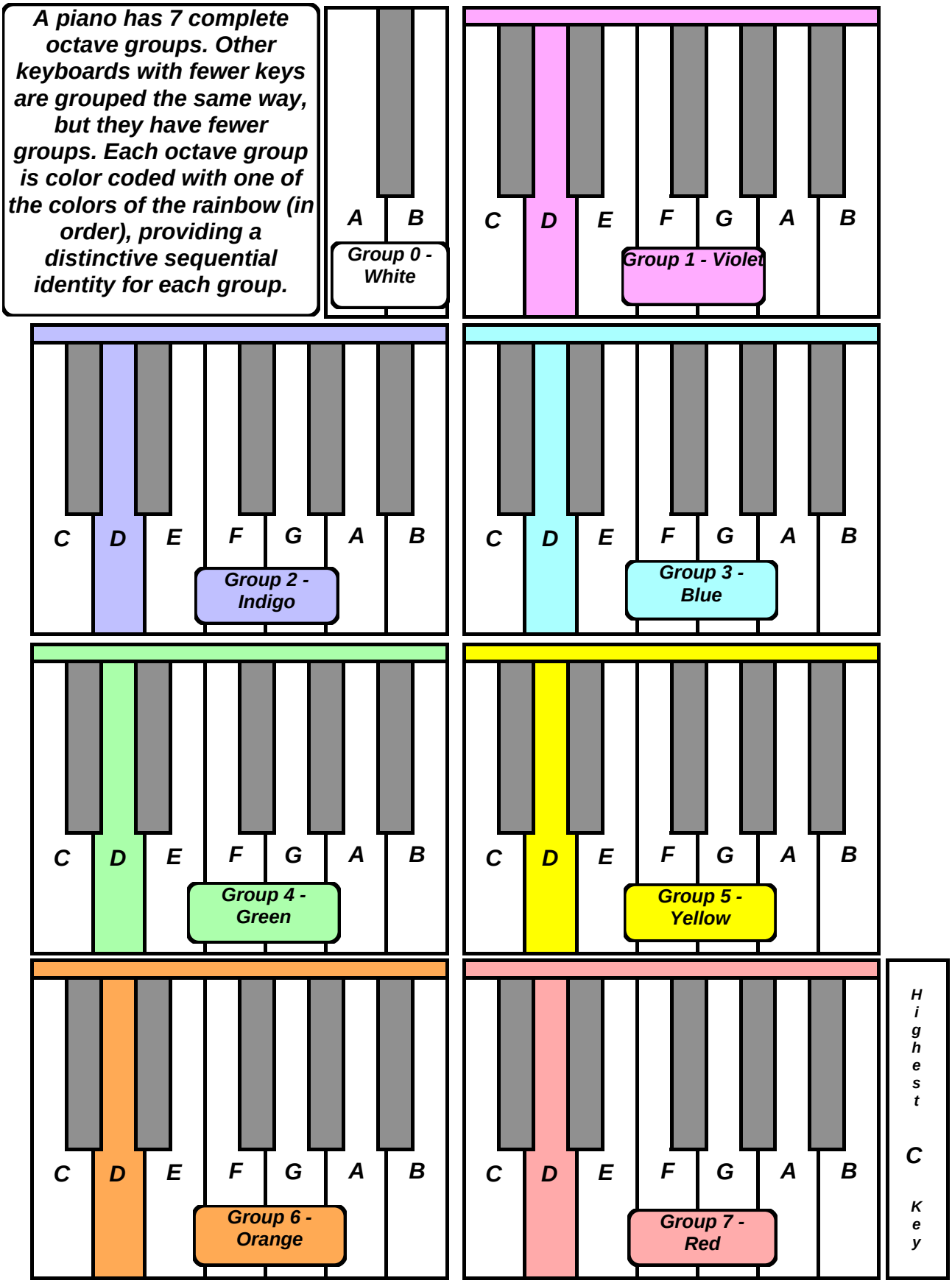
# The 7 Identical Octave Groups of the Keyboard

*A piano has 7 complete octave groups. Other keyboards with fewer keys are grouped the same way, but they have fewer groups. Each octave group is color coded with one of the colors of the rainbow (in order), providing a distinctive sequential identity for each group.*

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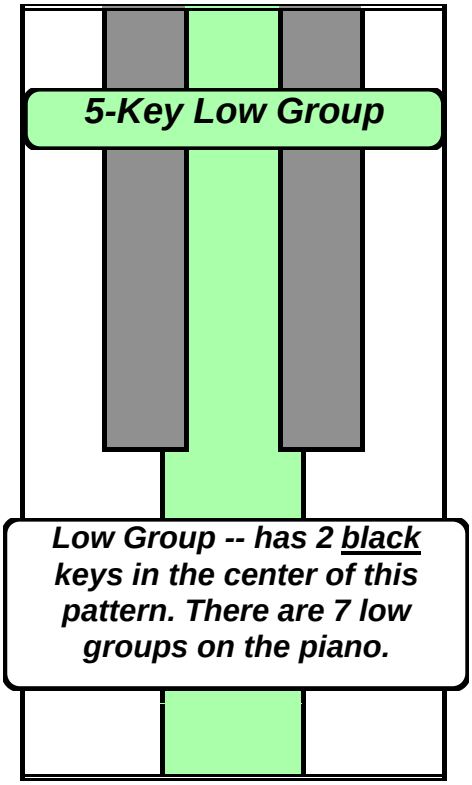
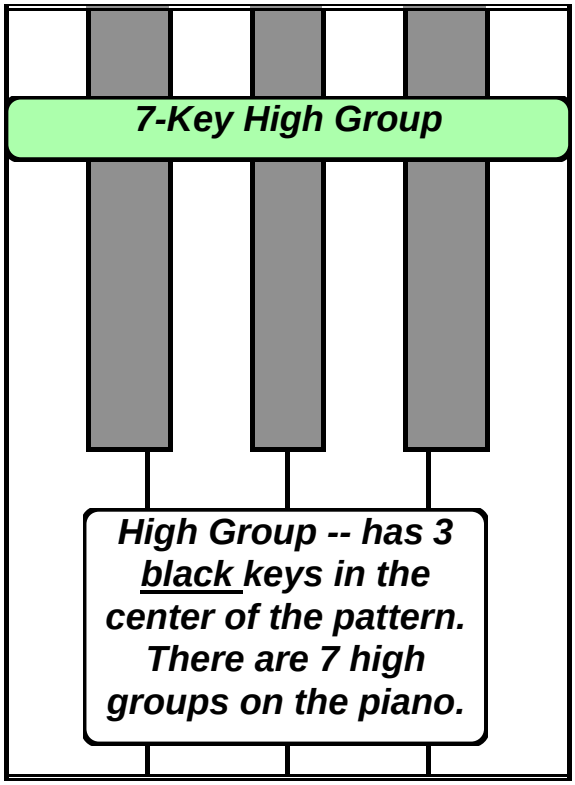
# *The Essential Roles of the 2 Subgroups of Each Octave Group*

***Each Octave Group contains 2 Subgroups: A 5-key Low Group and a 7-key High Group. Within each Octave Group, the Low Group has lower sounds than its High Group.***

***The most prominent visually identifable keys on a musical keyboard are, of course, the black keys. They are visually (and tactually) the essential location markers for all of the keys on the keyboard.***

***Their essential role is carried out by their spacing (and standing out above the white keys). This spacing in groups of 2 and 3 marks, identifies and basically defines each octave group. These groups of 2 and 3 black keys make it possible to read the keyboard - and make it possible to read the windows key maps.***

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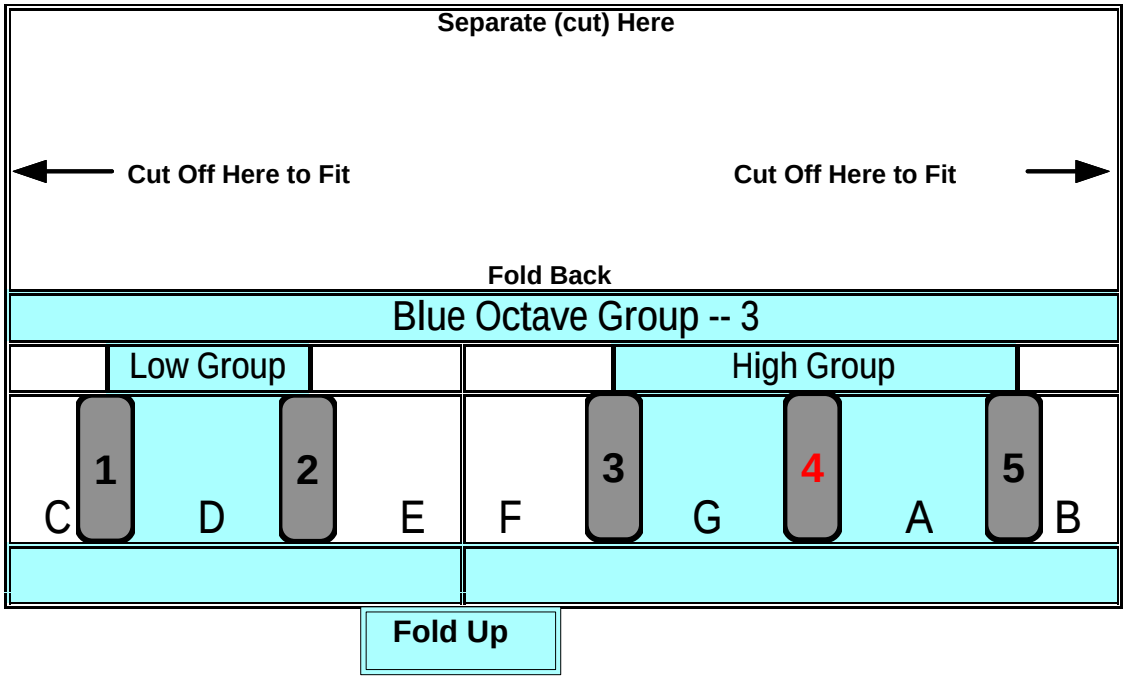
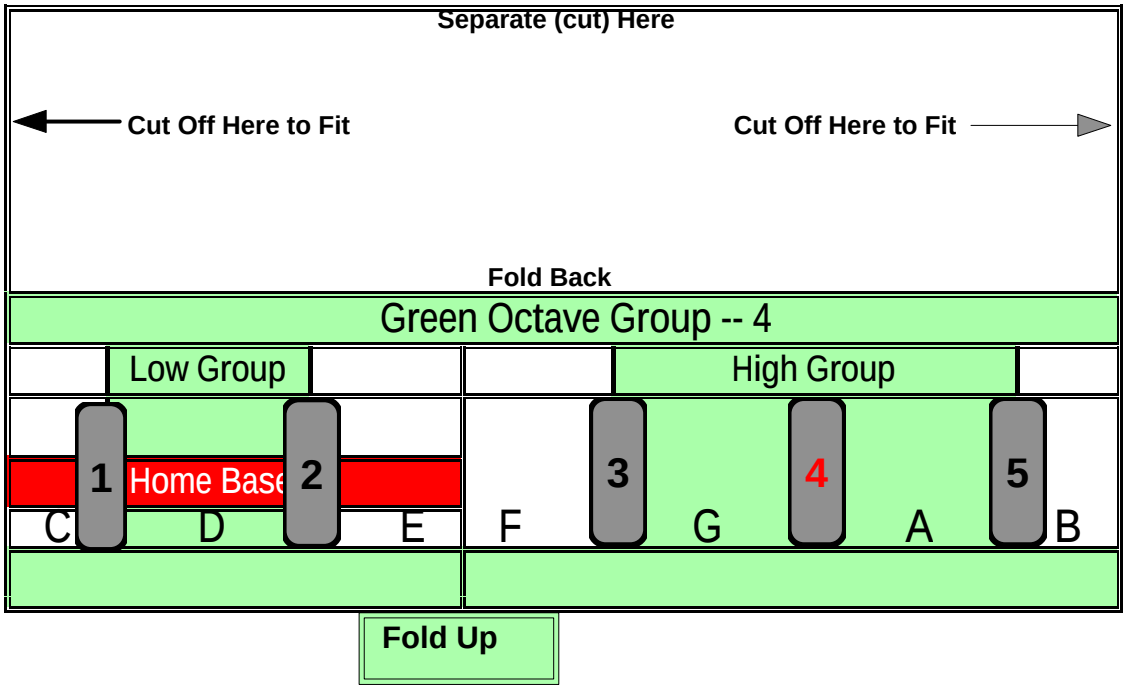
***Octave Group Locator Labels.*** ***Here are samples of the 7 rainbow colored octave group labels that are designed for placing temporarily behind the black keys on the keyboard. These label the octave groups with the colors shown on the key diagrams and maps. The labels also show the names of the white keys. This way one can easily match the notes in a key map's blue octave group, for example, with the corresponding keys in the blue octave group on the keyboard. The labels can be left in place until no longer needed.***

## *Sample*




## *Sample*

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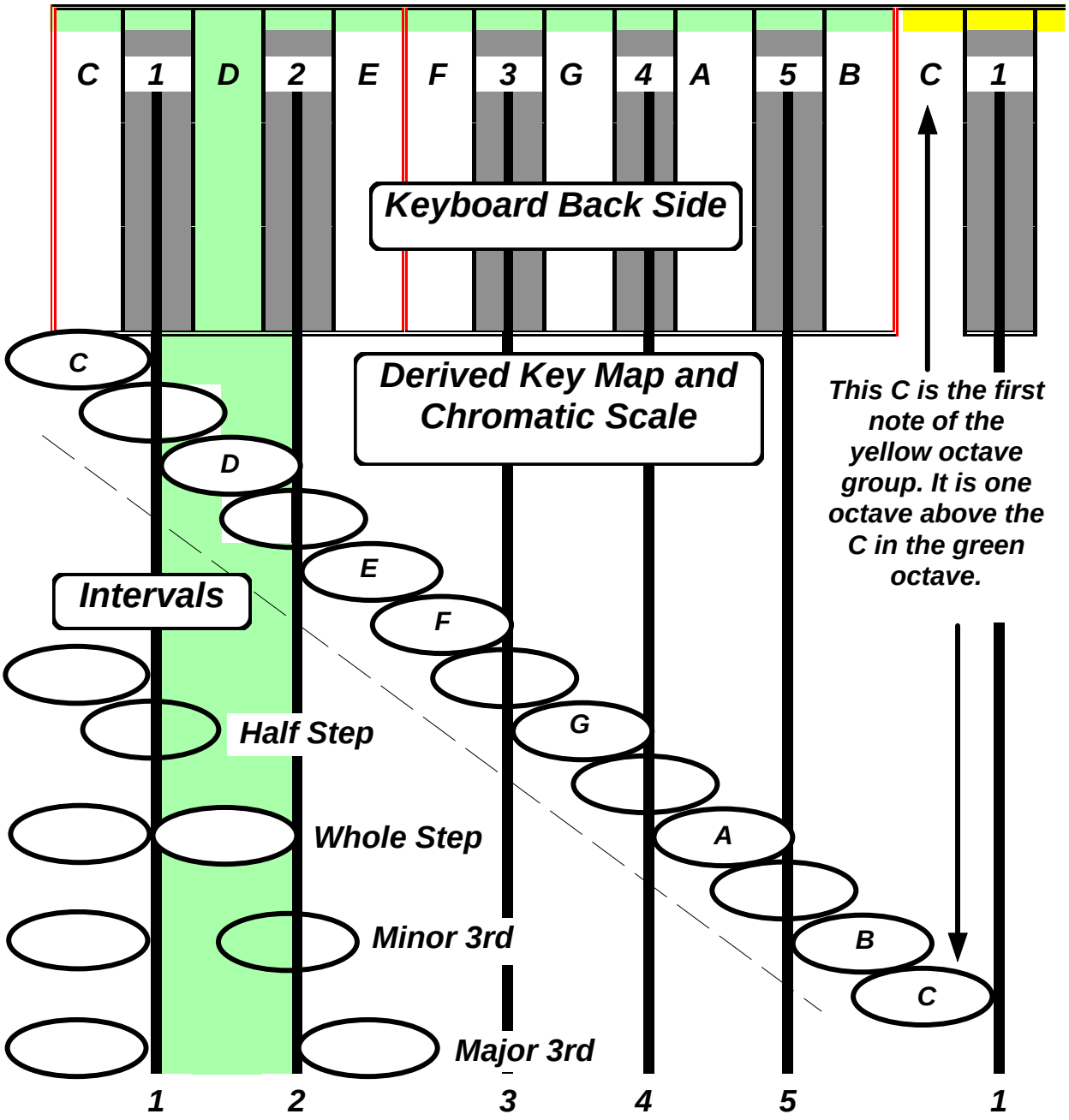
# Concepual Design of an Octave Group

***This diagram demonstrates how the horizontal spacing of the staff lines of key maps is derived from the spacing of the black keys on the keyboard. (A windows key map is a minaturized version of the lower part of this diagram.) So that key map notes can show musical intervals accurately, the notes are always a whole step in width. Two notes with edges touching are a whole step apart. Two notes overlapping by half are a half step apart. All note intervals are proportional to the sound intervals that they represent. We call this TruScaled. The sequence of notes on this diagram forms a chromatic scale from the green C to the yellow C.***

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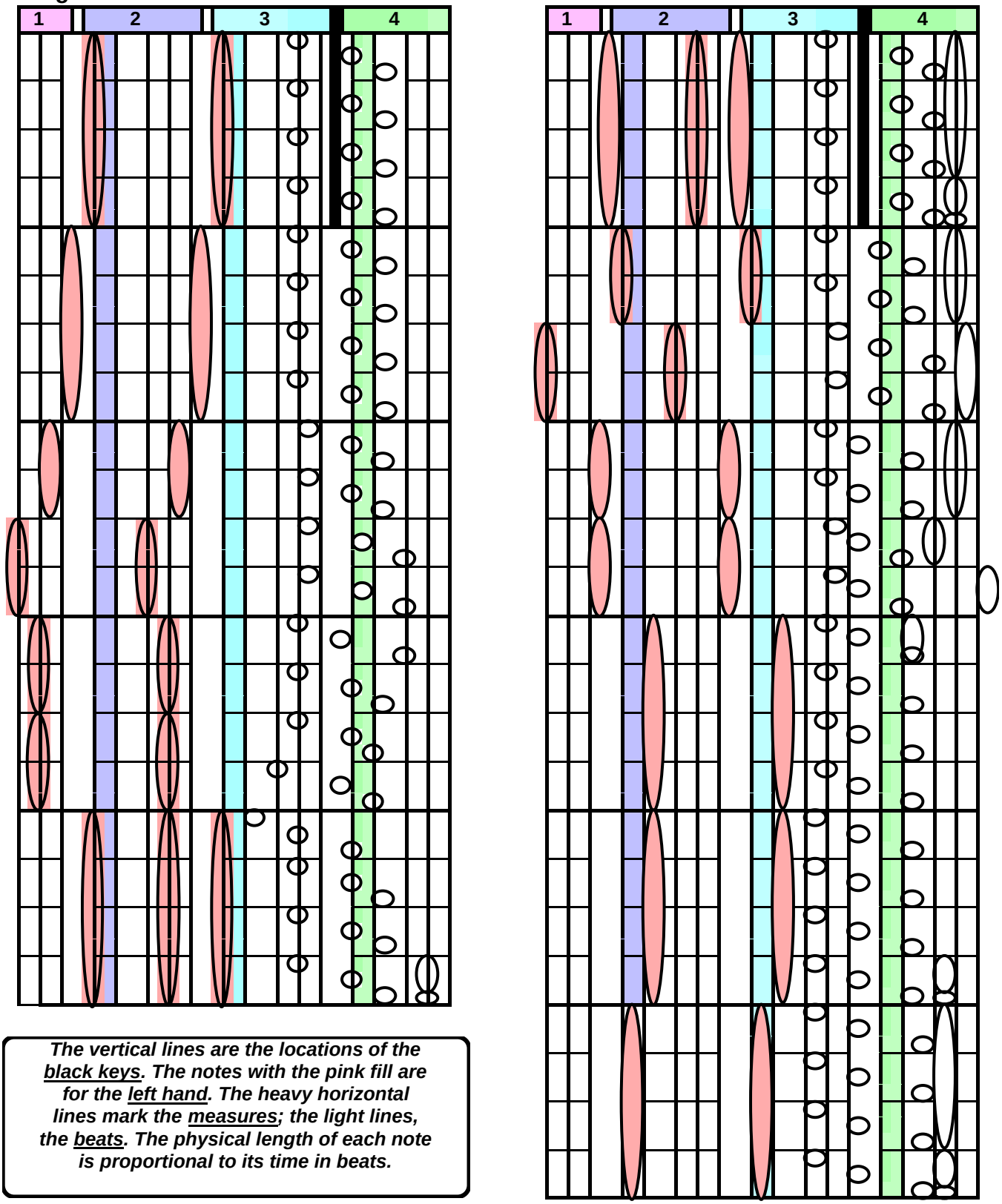
# *Example - Key Map*

## *Openng Bars of Beethoven's Moonlight Sonata*

**Adagio sostenuto #: 4 Beats: 4 MM: 52**




***The vertical lines are the locations of the black keys. The notes with the pink fill are for the left hand. The heavy horizontal lines mark the measures; the light lines, the beats. The physical length of each note is proportional to its time in beats.***

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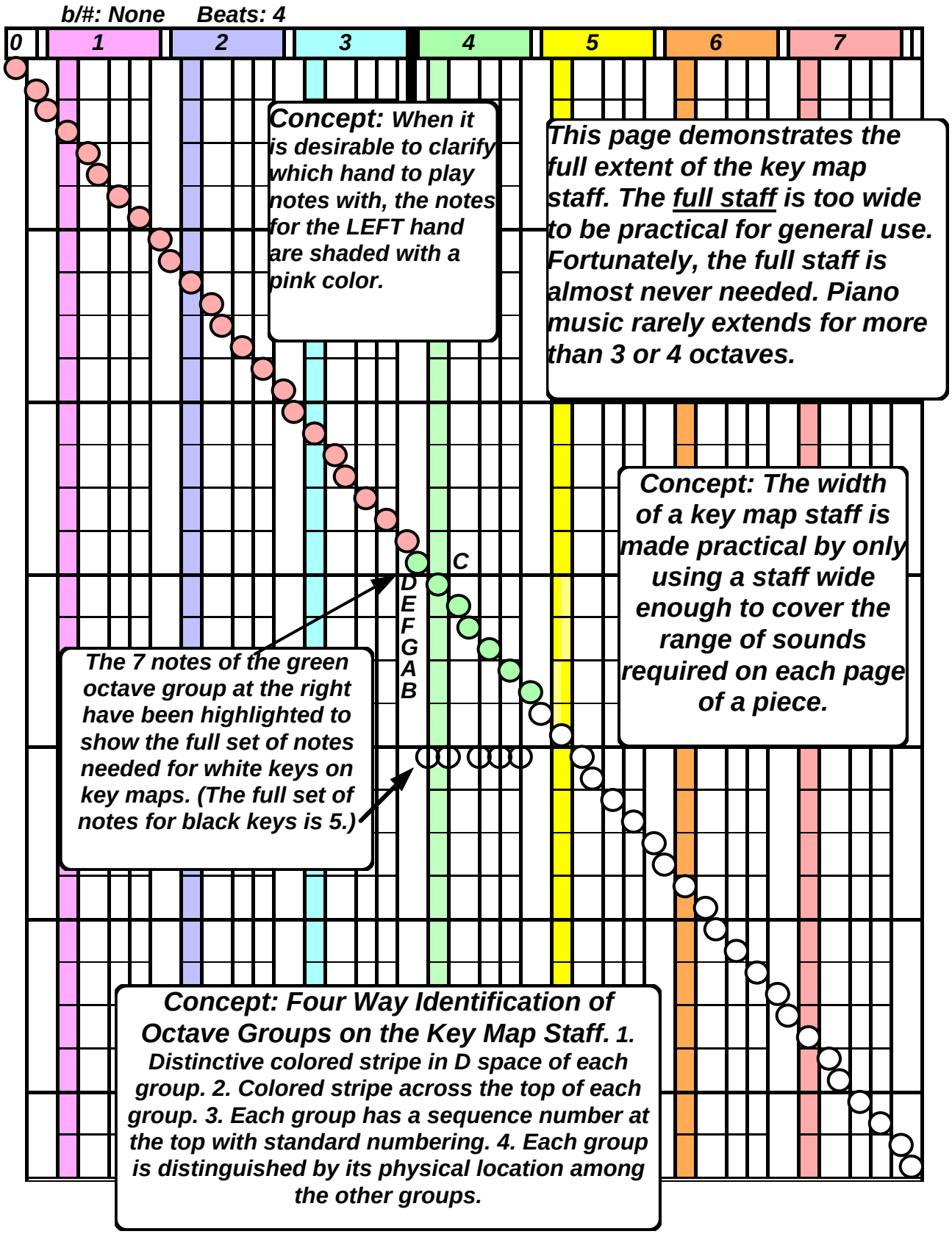
## Demo: Key Map With Notes For All 52 Piano White Keys




**Concept:** When it is desirable to clarify which hand to play notes with, the notes for the LEFT hand are shaded with a pink color.

This page demonstrates the full extent of the key map staff. The full staff is too wide to be practical for general use. Fortunately, the full staff is almost never needed. Piano music rarely extends for more than 3 or 4 octaves.

Concept: The width of a key map staff is made practical by only using a staff wide enough to cover the range of sounds required on each page of a piece.

The 7 notes of the green octave group at the right have been highlighted to show the full set of notes needed for white keys on key maps. (The full set of notes for black keys is 5.)

**Concept: Four Way Identification of Octave Groups on the Key Map Staff.** 1. Distinctive colored stripe in D space of each group. 2. Colored stripe across the top of each group. 3. Each group has a sequence number at the top with standard numbering. 4. Each group is distinguished by its physical location among the other groups.

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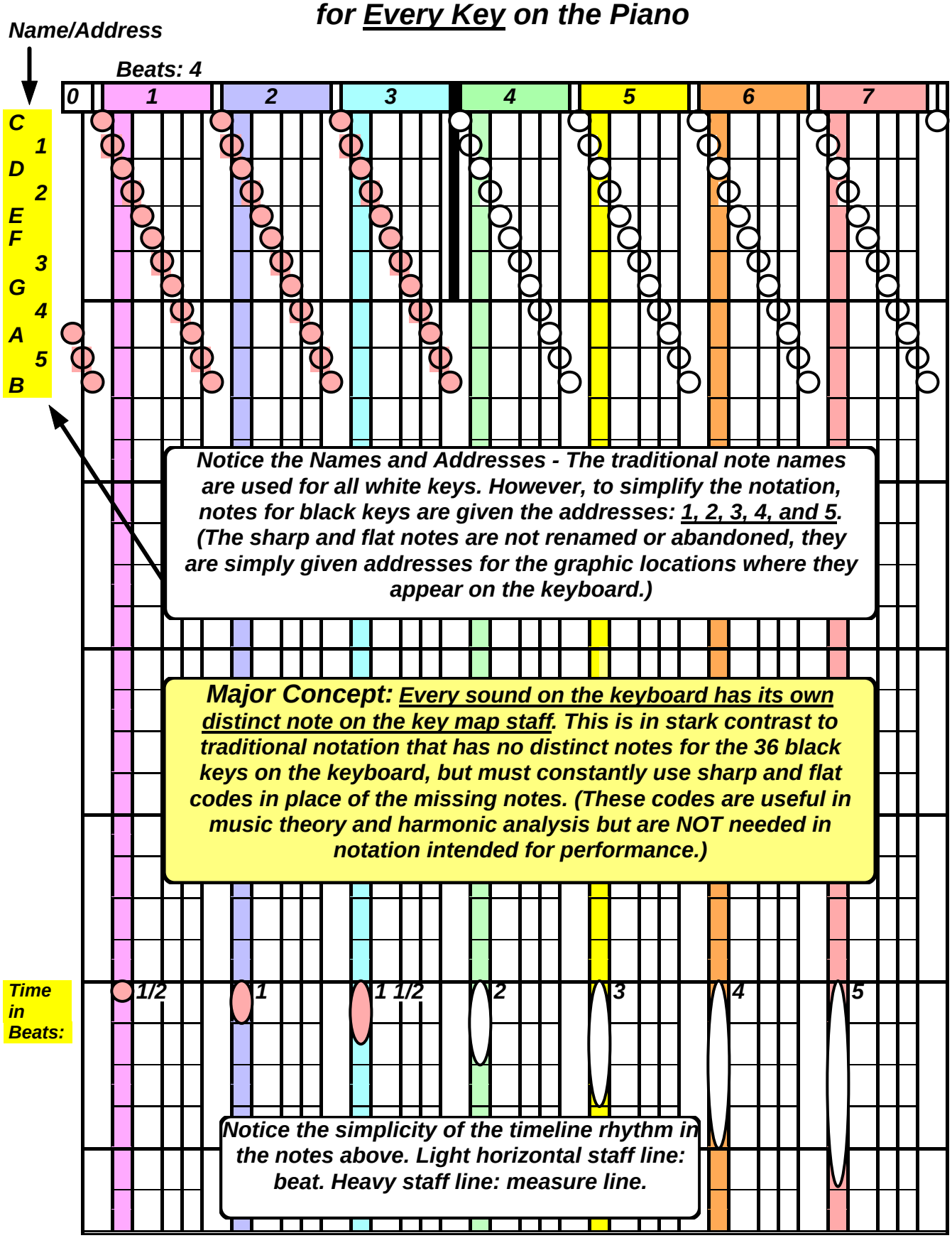
# Key Map Showing All 7 Octave Groups and a Note for Every Key on the Piano

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# Key Maps Design Concepts - Summary

***This page and the next are intended to serve as a review and summary of the previous pages. You may also find a few ideas not already covered on those pages.***

### The Graphic Design of the Keyboard.

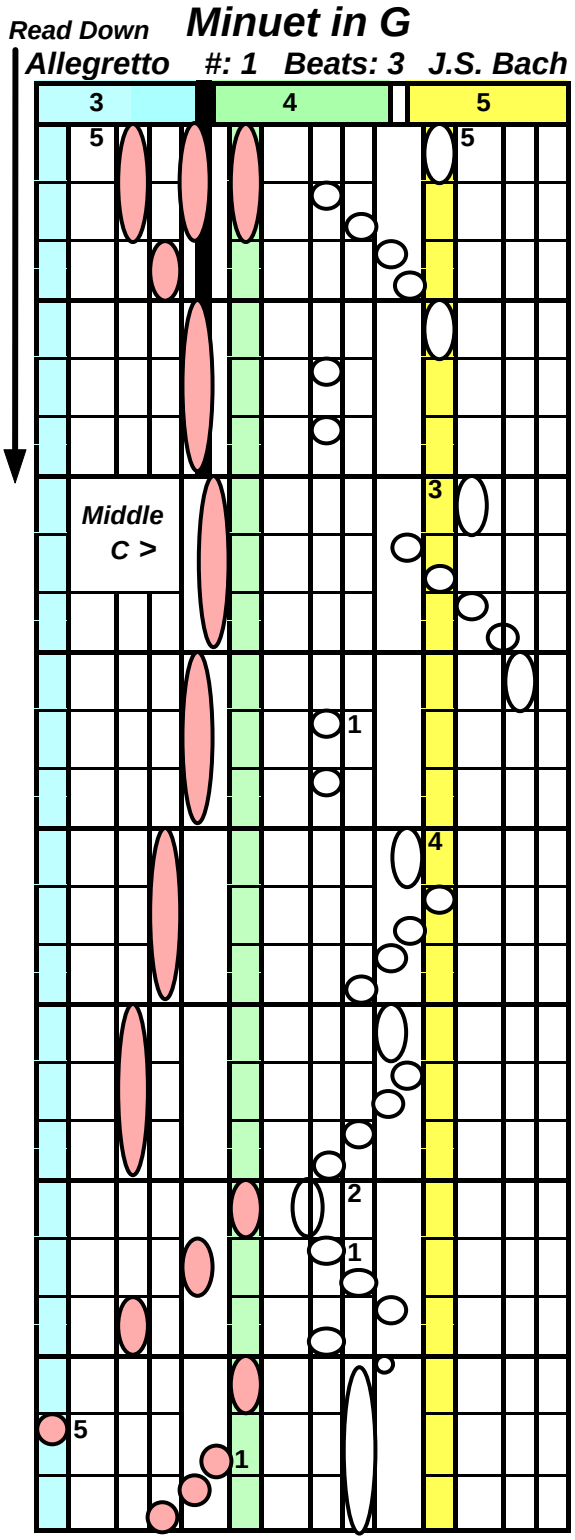
*Making the notation closely resemble the keyboard was the major challenge in designing the windows key maps. The key maps had to match the keyboard well enough so that one could easily find and play any key displayed on a key map. The solution involved a number of critical decisions that took advantage of the very special way that the keyboard is designed. Fortunately, and unique among musical instruments, the keyboard provides a graphic display of all of the useful music pitches, in order, from the lowest to the highest. Not only that, but the half-step equal horizontal spacing of these pitches made it possible to design a graphically matching keyboard notation based on this equal half step spacing.*

### The Vertical Staff.

*Perhaps the most significant concept in the development of the windows notation was to use vertical lines, horizontally spaced like the black keys, as the musical staff. This staff is vertically oriented so that time flows downward, instead of horizontally as with traditional notation. The great advantage of this vertical orientation is that the left/right movements of the notes match the corresponding left/right movements of the fingers on the keyboard.*

### Notes on the Vertical Staff.

*Notes for the BLACK KEYS are placed directly on a vertical staff line. Notes for WHITE KEYS are always placed in the space next to a vertical line and touching the line. C, E, F, and B touch one line. D, G, and A are located between 2 staff lines, touching both of them. (See the example at the right.) These locations visually match the locations of the corresponding keys on the keyboard.*




*Pink notes - left hand*
*White notes - right hand*

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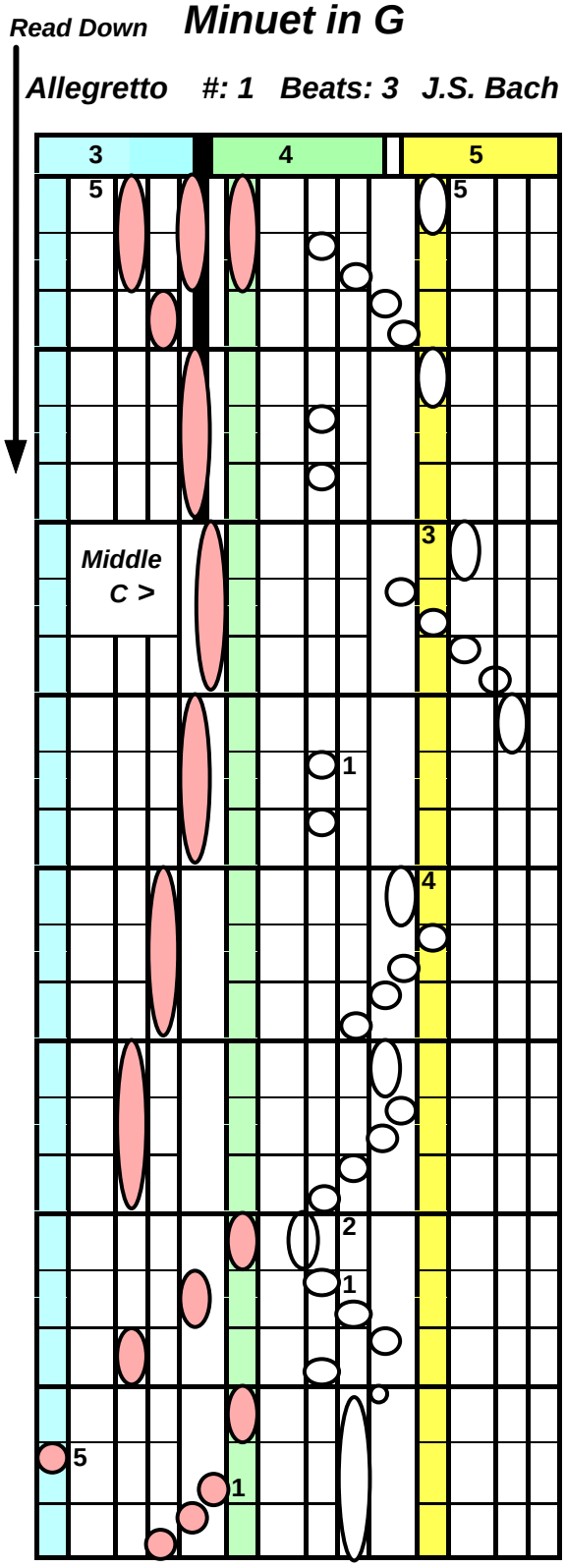
***The Natural Grouping of the Octaves.*** ***Another essential element in the design of an interface between keyboard and notation is the natural grouping of sounds into octaves. Again, the visual aspect of the keyboard is itself the critical factor in making this practical.***

***Patterns of Sound.*** ***The process begins with the nature of musical sounds and the patterns that they form. The piano keyboard produces 88 different sound pitches. These 88 musical sound pitches occur in patterns that are the basis for making music. Among these naturally occuring patterns are half-steps, whole-steps, and octave intervals. The piano keyboard itself, is a visual display of these patterns, and provides half of the visual basis for the windows graphical interface. The other half of this pairing is the visual display provided by the windows key maps that we have been discussing.***

***Octave Intervals.*** ***These intervals form especially useful and interesting sound and visual patterns. Octave intervals are 2 sounds that are related by their frequencies. The highest sound of the interval has exactly double the frequency of the lowest sound. (And, of course, the lowest sound has half the frequency of the highest sound.) Two sounds that are an octave apart have the same name and they sound so similar that it is often hard to tell the difference.***

***Octave Groups.*** ***These octave intervals on the keyboard are an essential element in the graphical user interface (GUI) of the windows notation. The "octave groups" of the keys on the keyboard consist of 12 keys (black and white) beginning with C and ending with B. The octave groups of notes in the sheet music are made up of 12 adjacent notes beginning with C, visually matching the keys with the same names on the keyboard. There are 7 of these visually identical "octave groups" making up the entire piano keyboard. Notation for the 3 octave groups at the middle of the keyboard is displayed at the right. These identical groups are distinguished from each other by their locations, by their colors, and by their numbers, from low 3 to high 5 showing at the top of each octave group.***




***Pink notes - left hand***
***White notes - right hand***

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# *Conclusion*

***For me, one of the most convincing reasons for learning to play the keyboard with the key maps is shown in the chart on the next page. This page shows graphically the huge differences between the numbers of notes to be learned just for the white keys in the two notation systems:***

| |
|---|
| ***Natural Notes - Grand Staff: 52 - Key Maps: 7*** |

| ***Not Shown on the Chart:*** |
|---|
| ***# Sharp Notes - Grand Staff: 36 - Key Maps: 5*** |
| ***b Flat Notes - Grand Staff: 36 - Key Maps: 5*** |
| ***# and b on White Keys - Grand Staff: Rare - Key Maps: None*** |
| ***Double Sharps and Flats - Grand Staff: Rare - Key Maps: None*** |

***It is true that the notes at the extremes of low and high are almost never used and don't need to be learned before they are needed, but this still leaves a huge gap in the numbers of notes that need to be memorized.***

***To conclude, it seems fitting to remember how well the graphic user interface matches the notes with the keys, both visually and by touch. There are also the benefits of the TruScaled Pitch and Rhythm and the added beauty of the multi-colored formats.***

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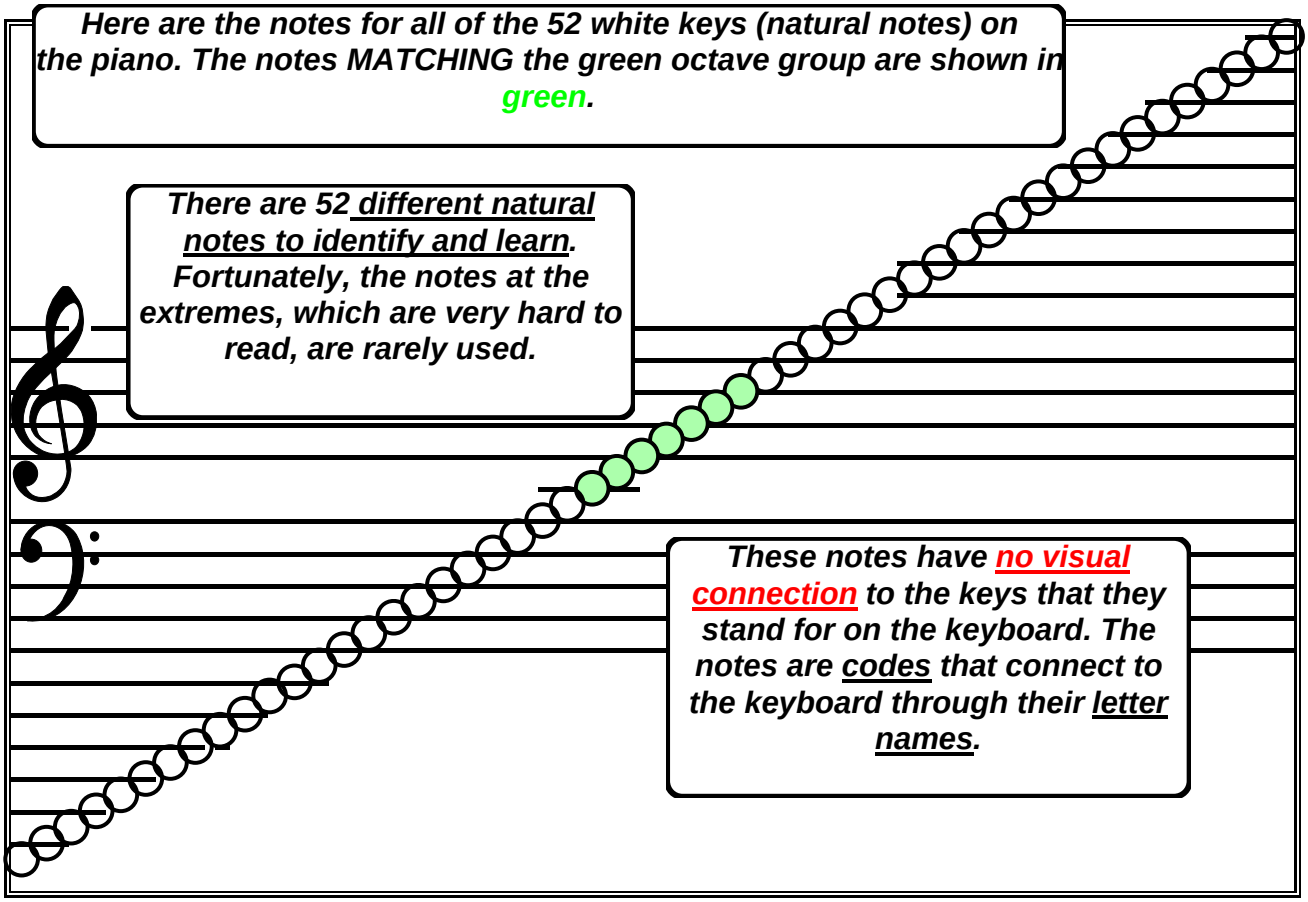
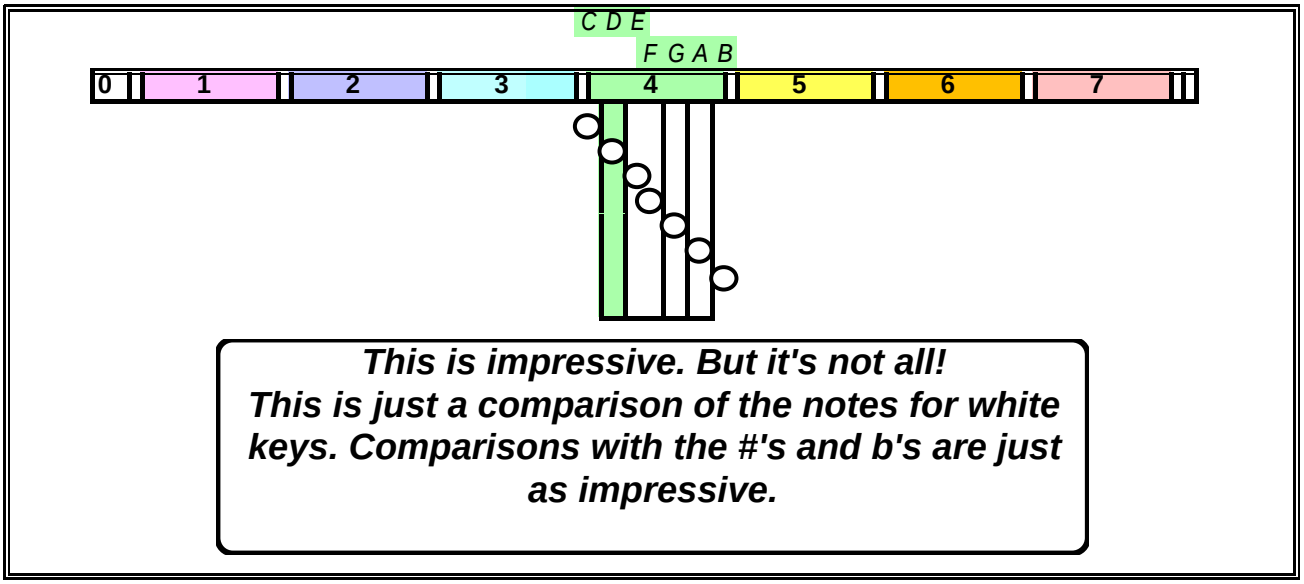
## Comparison With the Traditional Grand Staff - 52 vs 7




## Windows Key Maps - 7

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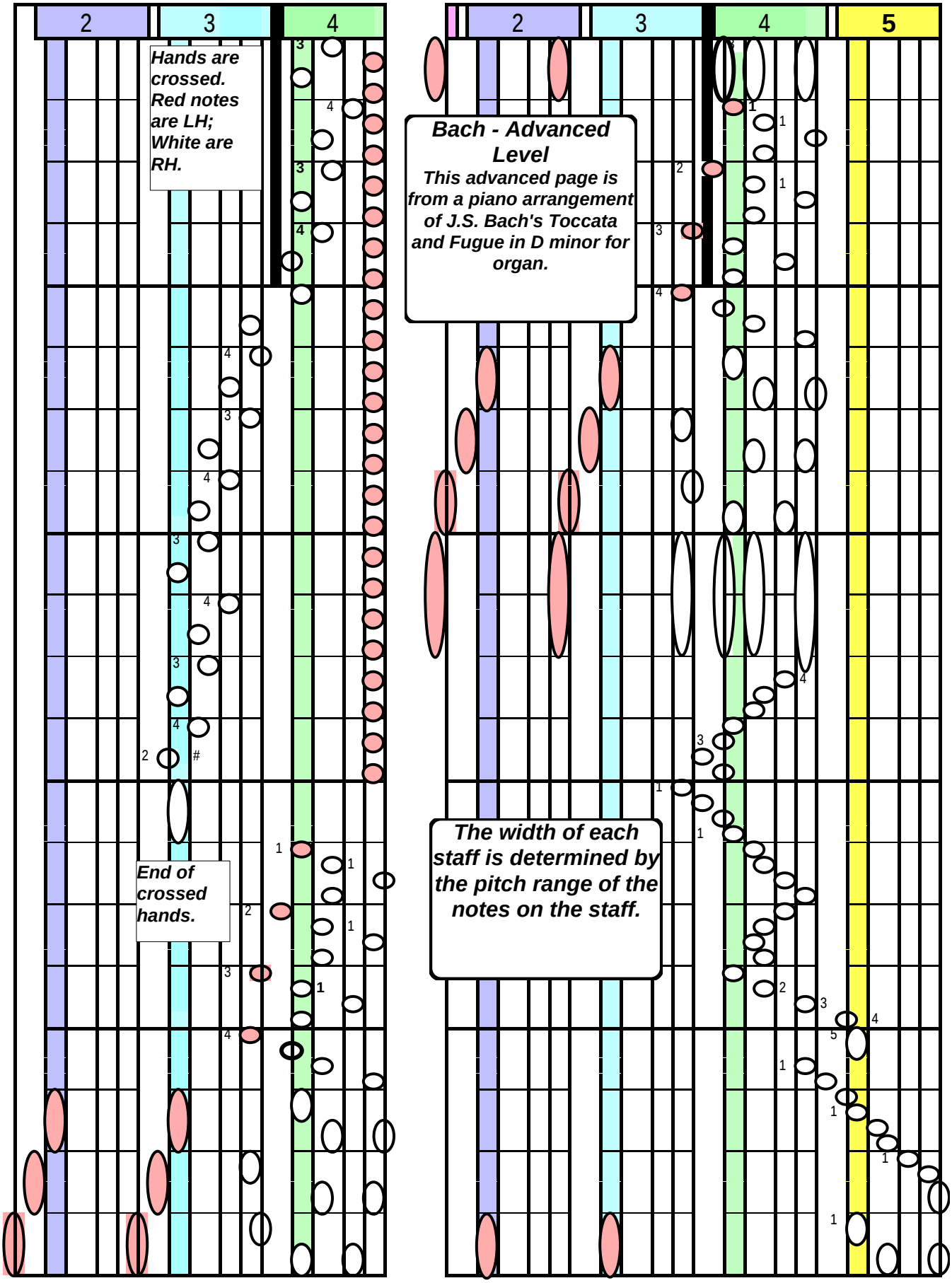


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